Influence Of Nanoparticles On Seed Germination And
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Advances in PhytonanotechnologyPhytotoxicity of NanoparticlesMycoremediation and Environmental SustainabilityApplication of Titanium DioxideMiniaturized Analytical DevicesNanotechnology in Plant Growth Promotion and ProtectionCopper Nanostructures: Next-Generation of Agrochemicals for Sustainable AgroecosystemsAgricultural NanobiotechnologySustainable Agriculture Reviews 41NanotoxicityNanomaterials for Environmental ApplicationNanotechnology and Plant SciencesInfluence of Seed Treatment with Nanoparticles on Morpho Physiological and Biochemical Changes in GroundnutNanoscience and Plant–Soil SystemsZinc-Based Nanostructures for Environmental and Agricultural ApplicationsAnatomy of Seed PlantsFruit CropsEnvironmental NanotechnologyPhytoremediationNanobiotechnology Applications in Plant ProtectionNew Visions in Plant ScienceNanobionicsImpact of Zinc Oxide Nanoparticles on Green Pea Plant and Seed Quality and Effects on Physiological Traits of Green Peas, Corn, and Zucchini by Silver NanoparticlesAdvanced Nanomaterials and NanotechnologyPlant Responses to NanomaterialsPlant BiotechnologyNanomaterials in Plants, Algae, and Microorganisms4th International Conference on Nanotechnologies and Biomedical EngineeringNanopesticidesMicrobial Biotechnology in Environmental Monitoring and CleanupPlant Biotechnology: Progress in Genomic EraPlant Proteomic Research 3.0Nanotechnologies in Food and AgricultureNanomaterial Biointeractions at the Cellular, Organismal and System LevelsNanotechnology for Agriculture: Crop Production & ProtectionNanofood and Internet of Nano ThingsNanomaterials for EnergyComputational NanotechnologyCommercialization of NanotechnologyThe conference was represented by around 400 participants from several countries including delegates invited from USA, Germany, Japan, UK, Taiwan, Italy, Singapore, India etc. This book explores the development of nanopesticides and tests of their biological activity against target organisms. It also covers the effects of nanopesticides in the aquatic and terrestrial environments, along with related subjects including fate, behaviour, mechanisms of action and toxicity. Moreover, the book discusses the potential risks of nanopesticides for non-target organisms, as well as regulatory issues and future perspectives. Educational commissions continue to press the need for growth in higher education. In particular, universities in developing countries persist in putting their academic theory into practice by aiming to integrate their intellectual and cultural traditions into higher education. Evolving Corporate Education Strategies for Developing Countries: The Role of Universities presents the theories and opportunities for integrating corporate education into traditional universities as well as highlighting the professional development in different subject areas. This book provides relevant research important for policy makers, practitioners and scholars of higher education. This book gathers the proceedings of the 4th International Conference on
Nanotechnologies and Biomedical Engineering, held on September 18-21, 2019, in Chisinau, Republic of Moldova. It continues the tradition of the previous conference proceedings, thus reporting on both fundamental and applied research at the interface between nanotechnologies and biomedical engineering. Topics include: developments in bio-micro/nanotechnologies and devices; biomedical signal processing; biomedical imaging; biomaterials for biomedical applications; biomimetics; bioinformatics and e-health, and advances in a number of related areas. The book offers a timely snapshot of cutting-edge, multidisciplinary research and developments in the field of biomedical and nano-engineering.

Nanotechnology, Volume 46, the latest release in the Methods in Microbiology series, contains review articles on the application of nanotechnology in various fields of microbiology, including environmental microbiology, food microbiology and medical microbiology. Chapters in this new release include discussions on the Biosynthesis of Nanomaterials Utilizing Biomacromolecules, Nanotechnology in Medical Biology – Application of Nanodiagnostics in Infectious Diseases, Applications of Nanotechnology in Food Microbiology, Biosynthesis of Nanomaterials Utilizing Microorganisms, Nanotechnology in Medical Biology – Interaction of Pathogens and Nanostructured Surfaces, Biocompatible Polymers: Synthesis Methods, Surface Functionalization and its Biomedical Applications, and The Bacterial Flagellum. Written by experts in the field of microbiology from all over the world.

Contains high quality illustrations to enhance learning. Provides a comprehensive review of the literature in the area of nanotechnology/Copper Nanostructures: Next-Generation of Agrochemicals for Sustainable Agroecosystems considers the impact of copper-based nanostructures on agri-food sectors. Sections highlight the green synthesis of copper nanoparticles, production mechanisms, eco-safety, and future perspectives, discuss the increasing importance of copper nanomaterials in plant protection applications, describe the use of copper nanostructures in plant science applications, cover antimicrobial applications, explore copper nanostructure applications, and summarize current applications in agroecosystems, such as copper nanoparticles as nanosensors, their negative ecological effects, estimation risks, and more. Assesses the impact of a large variety of copper-based nanostructures on the agri-food sector. Discusses how the properties of a variety of copper-based nanomaterials make them effective for agricultural applications. Explains the challenges surrounding the mass production of copper-based nanomaterials. This book summarises various aspects of plant biotechnology and is divided into 27 chapters. This edition discusses: plant cell culture and development, plant tissue culture, micropropagation, germplasm storage, haploid plants, triploid plants, in vitro pollination and fertilisation, protoplast isolation and culture, somatic cell hybridisation, synthetic seeds, plant breeding, plant derived vaccines, genetically modified foods, improving photosynthesis and crop yield, insect resistant plants, fungus resistant plants, virus resistant plants, ornamental plants, medicinal plants, recombinant DNA, molecular markers, intellectual property rights. Chapters on nanotechnology for micronutrients in soil-plant systems are a unique feature of the book.

Nanotoxicity: Prevention, and Antibacterial Applications of Nanomaterials focuses on the fundamental concepts for cytotoxicity and genotoxicity of nanomaterials. It sheds more light on the underlying phenomena and fundamental mechanisms through which nanomaterials interact with organisms and physiological media. The book provides good guidance for toxic prevention methods and management in the manufacture/application/disposal. The book also discusses the potential applications of nanomaterials-based antibiotics. The potential toxic effects of nanomaterials result not only from the type of base materials, but also from their size/ligands/surface chemical modifications. This book discusses why different classes of nanomaterials display toxic properties, and what can be done to mitigate this toxicity. It also explores how nanomaterials are being used as antimicrobial agents, being used to purify air and water, and counteract a range of infectious diseases. This is an important reference for materials scientists, environmental scientists and biomedical scientists, who are seeking to gain a greater understanding of how nanomaterials can be used to combat toxic agents, and how the toxicity of nanomaterials themselves can best be mitigated.

Explains the underlying phenomena and fundamental mechanisms through which nanomaterials interact with organisms and physiological media. Outlines major methods for mitigating and prevention of nanotoxicity. Discusses the applications of nanomaterials-based antibiotics in plants, algae and microorganisms: Concepts and Controversies: Volume One discusses the vast amount of nanomaterials that have been released into the environment in a relatively short amount of time. There is a need to understand what the implications to the health of our biota and ecosystems are as the earth is increasingly inundated with these materials. Not all of the effects are negative, but their impacts are increasing exponentially due to their size, quantity and other factors. Covers the issues of nanoparticles on more simple organisms and their ecosystems. Presents issues that are specific to terrestrial ecosystems. Contains contributions from global experts who help increase understanding at the physiological, biochemical, molecular, and even genomic and proteomic levels. Provides a critical assessment of the progress taking place on this topic and sheds light on future research needs. This book assesses the current challenges and opportunities for the next generation of agriculture and food science. Examining the
role of nanotechnology and the application of related tools and techniques to transform the future of food, it also discusses in detail nanotechnology in food production, processing and packaging, as well as the benefits of and concerns regarding nanofoods (nanotoxicity and food forensics). Considering the potential of IoT to revolutionize agriculture and the food industry by radically reducing costs and improving productivity and profits, the book highlights the necessity of integrating IoT and nanotechnology into the next generation of agriculture and food science. Further, it presents a detailed analysis of IoNT implementation, together with the goals that have to be met in order to achieve significant improvements in the agri-food sector. In addition it explores a range of challenges, risks, and concerns that have a direct or indirect impact on nanotechnology and IoNT implementation in agriculture and the food industry. In closing, it discusses the use of green nanotechnology and green IoNT in order to create smart, safe, and sustainable agriculture and healthy food. The Special Issue “Plant Proteomics 3.0” was conceived in an attempt to address the recent advancements in as well as limitations of current proteomic techniques and their diverse applications to attain new insights into plant molecular responses to various biotic and abiotic stressors and the molecular bases of other processes. Proteomics’ focus is also related to translational purposes, including food traceability and allergen detection. In addition, bioinformatic techniques are needed for more confident identification, quantitation, data analysis and networking, especially with non-model or orphan plants, including medicinal and meditational plants as well as forest tree species. This Special Issue contains 23 articles, including four reviews and 19 original papers. The emergence of nanotechnology and the development of new nanodevices and nanomaterials have opened up exciting opportunities for novel applications in agriculture and biotechnology. Nanotechnology has the potential to modernize agricultural research and practice, but although it has gained momentum in the agriculture sector over last decade, there are still knowledge gaps between scientific communities. This book presents a comprehensive overview of current developments in nanotechnology-based sustainable agriculture. Focusing on various aspects of nanotechnology in different sectors of agriculture, such as crop production, soil fertility management and crop improvement, it offers insights into the current trends and future prospects of nanotechnology, along with the benefits and risks and their impact on agricultural ecosystems. It also highlights the use of nanotechnology to reduce agrochemical usage, to increase nutrient uptake efficiency and to improve water and nutrient management, and the use of nano-biosensors to manage plant diseases. The book is a valuable reference resource for scientists, policymakers, students and researchers who are engaged in developing strategies to cope with current agricultural challenges. This book highlights the implications of nanotechnology in plant sciences, particularly its potential to improve food and agricultural systems, through innovative, eco-friendly approaches, and as a result to increase plant productivity. Topics include various aspects of nanomaterials: biophysical and biochemical properties; methods of treatment, detection and quantification; methods of quantifying the uptake of nanomaterials and their translocation and accumulation in plants. In addition, the effects on plant growth and development, the role of nanoparticles in changes in gene and protein expression, and delivery of genetic materials for genetic improvement are discussed. It also explores how nanotechnology can improve plant protection and plant nutrition, and addresses concerns about using nanoparticles and their compliance. This book provides a comprehensive overview of the application potential of nanoparticles in plant science and serves as a valuable resource for students, teachers, researchers and professionals working on nanotechnology. Fruit Crops: Diagnosis and Management of Nutrient Constraints is the first and only resource to holistically relate fruits as a nutritional source for human health to the state-of-the-art methodologies currently used to diagnose and manage nutritional constraints placed on those fruits. This book explores a variety of advanced management techniques, including open field hydroponic, fertigation/bio-fertigation, the use of nano-fertilizers, sensors-based nutrient management, climate-smart integrated soil fertility management, inoculation with microbial consortium, and endophytes backed up by ecophysiology of fruit crops. These intricate issues are effectively presented, including real-world applications and future insights. Presents the latest research, including issues with commercial application Details comprehensive insights into the diagnosis and management of nutrient constraints Includes contributions by world renowned researchers, providing global perspectives and experience. This book provides in-depth reviews of the effects of nanoparticles on the soil environment, their interactions with plants and also their potential applications as nanofertilizers and pesticides. It offers insights into the current trends and future prospects of nanotechnology, including the benefits and risks and the impact on agriculture and soil ecosystems. Individual chapters explore topics such as nanoparticle biosynthesis, engineered nanomaterials, the use of nano-clays for remediation of polluted sites, nanomaterials in water desalination, their effect on seed germination, plant growth, and nutrient transformations in soil, as well as the use of earthworms as bioremediating agents for nanoparticles. It is a valuable resource for researchers in academia and industry working in the field of agriculture, crop protection, plant sciences, applied microbiology, soil biology and
environmental sciences. Discover the role of nanotechnology in promoting plant growth and protection through the management of microbial pathogens. In Nanotechnology in Plant Growth Promotion and Protection, distinguished researcher and author Dr. Avinash P. Ingle delivers a rigorous and insightful collection of some of the latest developments in nanotechnology particularly related to plant growth promotion and protection. The book focuses broadly on the role played by nanotechnology in growth promotion of plants and their protection through the management of different microbial pathogens. You’ll learn about a wide variety of topics, including the role of nanomaterials in sustainable agriculture, how nano-fertilizers behave as soil feed, and the dual role of nanoparticles in plant growth promotion and phytopathogen management. You’ll also discover why nanotechnology has the potential to revolutionize the current agricultural landscape through the development of nano-based products, like plant growth promoters, nano-fertilizers, nano-pesticides, and nano-insecticides. Find out why nano-based products promise to be a cost-effective, economically viable, and eco-friendly approach to tackling some of the most intractable problems in agriculture today. You’ll also benefit from the inclusion of: A thorough introduction to the prospects and impacts of using nanotechnology to promote the growth of plants and control plant diseases. An exploration of the effects of titanium dioxide nanomaterials on plant growth and the emerging applications of zinc-based nanoparticles in plant growth promotion. Practical discussions of nano-fertilizer in enhancing the production potentials of crops and the potential applications of nanotechnology in plant nutrition and protection for sustainable agriculture. A concise treatment of nanotechnology in seed science and soil feed. Toxicological concerns of nanomaterials used in agriculture. Perfect for undergraduate, graduate, and research students of nanotechnology, agriculture, plant science, plant physiology, and crops, Nanotechnology in Plant Growth Promotion and Protection will also earn a place in the libraries of professors and researchers in these areas, as well as regulators and policymakers. An authoritative text/reference on the structure and development of seed plants. Presents the latest concepts in plant anatomy through experimental, histochemical, and ultrastructural approaches to the study of biological material. Includes new concepts and terms; expanded sections on flower, fruit, and seed; and a new description of characters used in keying out woods. Several nano-scale devices have emerged that are capable of analysing plant diseases, nutrient deficiencies and any other ailments that may affect food security in agro-ecosystems. It has been envisioned that smart delivery systems can be developed and utilised for better management of agricultural ecosystems. These systems could exhibit beneficial, multi-functional characteristics, which could be used to assess and also control habitat-imposed stresses to crops. Nanoparticle-mediated smart delivery systems can control the delivery of nutrients or bioactive and/or pesticide molecules in plants. It has been suggested that nano-particles in plants might help determine their nutrient status and could also be used as cures in agro-ecosystems. Further, to enhance soil and crop productivity, nanotechnology has been used to create and deliver nano fertilizers, which can be defined as nano-particles that directly help supply nutrients for plant growth and soil productivity. Nano-particles can be absorbed onto clay networks, leading to improved soil health and more efficient nutrient use by crops. Additionally, fertilizer particles can be coated with nano-particles that facilitate slow and steady release of nutrients, reducing loss of nutrients and enhancing their efficiency in agri-crops. Although the use of nanotechnology in agro-ecosystems is still in its early stages and needs to be developed further, nano-particle-mediated delivery systems are promising solutions for the successful management of agri-ecosystems. In this context, the book offers insights into nanotechnology in agro-ecosystems with reference to biogenic nanoparticles. It highlights the: occurrence and diversity of Biogenic Nanoparticles • mechanistic approach involved in the synthesis of biogenic nanoparticles • synthesis of nanoparticles using photo-activation, and their fate in the soil ecosystem • potential applications of nanoparticles in agricultural systems • application and biogenic synthesis of gold nanoparticles and their characterization • impact of biogenic nanoparticles on biotic stress to plants • mechanistic approaches involved in the antimicrobial effects and cytotoxicity of biogenic nanoparticles • role of biogenic nanoparticles in plant diseases management • relevance of biological synthesized nanoparticles in the longevity of agricultural crops • design and synthesis of nano-biosensors for monitoring pollutants in water, soil and plant systems • applications of nanotechnology in agriculture with special refer to soil, water and plant sciences. A useful resource for postgraduate and research students in the field of plant and agricultural sciences, it is also of interest to researchers working in nano and biotechnology. An improved understanding of the interactions between nanoparticles and plant retorts, including their uptake, localization, and activity, could revolutionize crop production through increased disease resistance, nutrient utilization, and crop yield. This may further impact other agricultural and industrial processes that are based on plant crops. This two-volume book analyses the key processes involved in the nanoparticle delivery to plants and details the interactions between plants and nanomaterials. Potential plant nanotechnology applications for enhanced nutrient uptake, increased crop productivity and plant disease management are evaluated with careful consideration regarding safe use, social acceptance and ecological impact.
nanotechnological improvements in agricultural sciences. Most farmers and breeders can no longer simply turn to the older strategies, and new instructions are needed to adapt their systems to achieve their production goals. The book covers new information on using metabolomics and nanotechnology in agriculture. In these circumstances, all new data and technology are very important in plant science. The topics in this book are practical and user-friendly. They allow practitioners, students, and academicians with specific background knowledge to feel confident about the principles presented on a new generation of molecular plant biotechnology applications. Titanium dioxide is mainly used as a pigment and photocatalyst. It is possible to find it in food, cosmetics, building materials, electric devices, and others. This book contains chapters about application of titanium dioxide in different branches of economy such as the agriculture, the food industry, the medicine, the cosmetics, the water treatment technologies, and the semiconductors. Nanobiotechnology in agriculture is a new knowledge area that offers novel possibilities to achieve high productivity levels at manageable costs during the production and merchandising of crops. This book shows us how we can use the cutting-edge knowledge about agriculture, nanotechnology, and biotechnology to increase the agricultural productivity and shape a sustainable future in order to increase the social welfare in rural areas and preserve the environmental health. Specialists from several countries will provide their feedback on a range of relevant topics such as environment-friendly use of nanofertilisers, nanodevices, nano-food packaging, nanocoating and nanocarriers and their relationship with the modern agriculture. Nanobiotechnology Applications in Plant Protection: Volume 2 continues the important and timely discussion of nanotechnology applications in plant protection and pathology, filling a gap in the literature for nano applications in crop protection. Nanobiocides and nanobiocatalysts are examined in detail and presented as powerful alternatives for eco-friendly management of plant pathogens and nematodes. Leading scholars discuss the applications of nanobiomaterials as antimicrobials, plant growth enhancers and plant nutrition management, as well as nanodiagnostic tools in phytopathology and magnetic and supramagnetic nanostructure applications for plant protection. This second volume includes exciting new content on the roles of biologically synthesized nanoparticles in seed germination and zinc-based nanostructures in protecting against toxigenic fungi. Also included is new research in phytotoxicity, nano-scale fertilizers and nanomaterial applications in nematology and discussions on Botrytis grey mold and nanobiocatalysts. This book also explores the potential effects on the environment, ecosystems and consumers and addresses the implications of intellectual property for nanobiocides. Further discussed are nanotoxicity effects on the plant ecosystem and nano-applications for the detection, degradation and removal of pesticides. Zinc-Based Nanostructures for Environmental and Agricultural Applications shows how zinc nanostructures are being used in agriculture, food and the environment. The book has been divided into two parts: Part I deals with the synthesis and characterization of zinc-based nanostructures such as biogenic, plant, microbial, and actinobacteria mediated synthesis of zinc nanoparticles. Part II is focused on agri-food applications such as antibacterial, antifungal, antimicrobial, plant disease management, controlling post-harvest diseases, pesticide sensing and degradations, plant promotions, ZnO nanostructure for food packaging application, safe animal food and feed supplement, elimination of mycotoxins, and veterinary applications. Part III reviews technological developments in environmental applications such as risks and benefits for aquatic organisms and the marine environment, antiseptic activity and toxicity mechanisms, wastewater treatment, and zinc oxide-based nanomaterials for photocatalytic degradation of environmental and agricultural pollutants. The book discusses various aspects, including the application of zinc-based nanostructures to enhance plant health and growth, the effect on soil microbial activity, antimicrobial mechanism, phytotoxicity and accumulation in plants, the possible impact of zinc-based nanostructures in the agricultural sector as nano fertilizer, enhancing crop productivity, and other possible antimicrobial mechanisms of ZnO nanomaterials. Explores the impact of a large variety of zinc-based nanostructures on agri-food and environment sectors Outlines how the properties of zinc-based nanostructures mean they are particularly efficient in environmental and agricultural application areas Assesses the major challenges of synthesizing and processing zinc-based nanostructured materials This book presents a holistic view of the complex and dynamic responses of plants to nanoparticles, the signal transduction mechanisms involved, and the regulation of gene expression. Further, it addresses the phytosynthesis of nanoparticles, the role of nanoparticles in the antioxidative systems of plants and agriculture, the beneficial and harmful effects of nanoparticles on plants, and the application of nanoparticles and nanotubes to mass spectrometry, aiming ultimately at an analysis of the metabolomics of plants. The growing numbers of inventions in the field of nanotechnology are producing novel applications in the fields of biotechnology and agriculture. Nanoparticles have received much attention because of the unique physico-chemical properties of these compounds. In the life sciences, nanoparticles are used as “smart” delivery systems, prompting the Nobel Prize winner P. Ehrlich to refer to these compounds as “magic bullets.” Nanoparticles also play an important role in agriculture as compound fertilizers and nano-
pecific cellular organelles in plants. The influence of nanoparticles on plant growth and development, however, remains to be investigated. Lastly, this book reveals the research gaps that must be bridged in the years to come in order to achieve larger goals concerning the applications of nanotechnology in the plants sciences. In the 21st century, nanotechnology has become a rapidly emerging branch of science. In the world of physical sciences, nanotechnological tools have been exploited for a broad range of applications. In recent years, nanoparticles have also proven useful in several branches of the life sciences. In particular, nanotechnology has been employed in drug delivery and related applications in medicine. Bioremediation is the use of microorganisms’ metabolism to degrade waste contaminants (sewage, domestic, and industrial effluents) into non-toxic or less toxic materials by natural biological processes. Volume 2 offers new discussion of remediation through fungi—or mycoremediation—and its multifarious possibilities in applied remediation engineering and the future of environmental sustainability. Fungi have the biochemical and ecological capability to degrade environmental organic chemicals and to decrease the risk associated with metals, semi-metals, noble metals, and radionuclides, either by chemical modification or by manipulating chemical bioavailability. Additional expanded texts shows the capability of these fungi to form extended mycelia networks, the low specificity of their catabolic enzymes, and their use against pollutants as a growth substrate, making these fungi well suited for bioremediation processes. Their mycelia exhibit the robustness of adapting to highly limiting environmental conditions often experienced in the presence of persistent pollutants, which makes them more useful compared to other microbes. Despite dominating the living biomass in soil and being abundant in aquatic ecosystems, however, fungi have not been exploited for the bioremediation of such environments until this added Volume 2. This book covers the various types of fungi and associated fungal processes used to clean up waste and wastewaters in contaminated environments and discusses future potential applications. This book presents recent developments involving the role of nanoparticles on plant physiology and growth. Nanotechnology applications include improvement of agricultural production using bio-conjugated NPs (encapsulation), transfer of DNA in plants for development of insect pest-resistant varieties, nanoformulations of agrochemicals such as pesticides and fertilizers for crop improvement, and biosensors/nanobiosensors in crop protection for identification of diseases and residues of agrochemicals. Recent findings on the increased use of nanotechnology in agriculture by densely populated countries such as China and India indicate that this technology may impart a substantial impact on reducing hunger, malnutrition, and child mortality. The population of the world continues to increase at an alarming rate. The trouble linked with overpopulation ranges from food and water scarcity to inadequacy of space for organisms. Overpopulation is also linked with several other demographic hazards, for instance, population blooming will not only result in exhaustion of natural repositories, but it will also induce intense pressure on the world economy. Today nanotechnology is often discussed as a key discipline of research but it has positive and negative aspects. Also, due to industrialization and ever-increasing population, nano-pollution has been an emerging topic among scientists for investigation and debate. Nanotechnology measures any substance on a macromolecular scale, molecular scale, and even atomic scale. More importantly, nanotechnology deals with the manipulation and control of any matter at the dimension of a single nanometer. Nanotechnology and nanoparticles (NPs) play important roles in sustainable development and environmental challenges as well. NPs possess both harmful and beneficial effects on the environment and its harboring components, such as microbes, plants, and humans. There are many beneficial impacts exerted by nanoparticles, however, including their role in the management of waste water and soil treatment, cosmetics, food packaging, agriculture, biomedicines, pharmaceuticals, renewable energies, and environmental remedies. Conversely, NPs also show some toxic effects on microbes, plants, as well as human beings. It has been reported that use of nanotechnological products leads to the more accumulation of NPs in soil and aquatic ecosystems, which may be detrimental for living organisms. Further, toxic effects of NPs on microbes, invertebrates, and aquatic organisms including algae, has been measured. Scientists have also reported on the negative impact of NPs on plants by discussing the delivery of NPs in plants. Additionally, scientists have also showed that NPs interact with plant cells, which results in alterations in growth, biological function, gene expression, and development. Thus, there has been much investigated and reported on NPs and plant interactions in the last decade. This book discusses the most recent work on NPs and plant interaction, which should be useful for scientists working in nanotechnology across a wide variety of disciplines. This book provides relevant findings on nanoparticles’ toxicity, their uptake, translocation and mechanisms of interaction with plants at cellular and sub-cellular level. The small size and large specific surface area of nanoparticles endow them with high chemical reactivity and intrinsic toxicity. Such unique physicochemical properties draw global attention of scientists to study potential risks and adverse effects of nanoparticles in the environment. Their toxicity has pronounced effects and consequences for plants and ultimately the whole ecosystem. Plants
growing in nanomaterials-polluted sites may exhibit altered metabolism, growth reduction, and lower biomass production. Nanoparticles can adhere to plant roots and exert physicochemical toxicity and subsequently cell death in plants. On the other hand, plants have developed various defense mechanisms against this induced toxicity. This book discusses recent findings as well as several unresolved issues and challenges regarding the interaction and biological effects of nanoparticles. Only detailed studies of these processes and mechanisms will allow researchers to understand the complex plant-nanomaterial interactions. This book presents a comprehensive overview of new and emerging nanotechnologies. It includes aspects of nanoparticle monitoring, toxicity, and public perception, and covers applications that address both crop growing and treatment of agricultural wastewater. Topics include nanoagrochemicals (nanofertilizers, -pesticides, -herbicides), nanobiosensors, and nanotechnologies for food processing, packaging, and storage, crop improvement and plant disease control. The group of expert authors is led by an experienced team of editors. This text details the plant-assisted remediation method, “phytoremediation”, which involves the interaction of plant roots and associated rhizospheric microorganisms for the remediation of soil contaminated with high levels of metals, pesticides, solvents, radionuclides, explosives, crude oil, organic compounds and various other contaminants. Many chapters highlight and compare the efficiency and economic advantages of phytoremediation to currently practiced soil and water treatment practices. Volume 5 of Phytoremediation: Management of Environmental Contaminants provides the capstone of the series. Taken together, the five volumes provide a broad–based global synopsis of the current applications of phytoremediation using plants and the microbial communities associated with their roots to decontaminate terrestrial and aquatic ecosystems. Refinement in sequencing technologies and potential of genomic research resulted in meteoric growth of biological information such as sequences of DNA, RNA and protein requiring databases for efficient storage, management and retrieval of the biological information. Also, computational algorithms for analysis of these colossal data became a vital aspect of biological sciences. The work aims to show the process of turning bioscience innovation into companies and products, covering the basic science, the translation of science into technology. Due to rapid developments, there seems to be no basic difference between the pharmaceutical industry and the biotechnological industry. However, approved products in the pipeline and renewed public confidence make it one of the most promising areas of economic growth in the near future. India offers a huge market for the products as well as cheap manufacturing base for export. The book is a sincere work of compilation of new and recent advances in the topic of concern through various innovative researches and scientific opinion therefrom. The book is dedicated to the readers who will definitely find it interesting and knowledgeable in carrying out their respective researches in different aspects of applied microbiology and biotechnology. Advances in Phytonanotechnology: From Synthesis to Application guides readers through various applications of nanomaterials on plants by presenting the latest research related to nanotechnology and nanomaterials on plant systems. The book focuses on the effects of these applications on plant morphology, physiology, biochemistry, ecology and genetics. Sections cover the impact on plant yield, techniques, a review of positive and negative impacts, and an overview of current policies regarding the use of nanotechnology on plants. Additionally, the book offers insights into the appropriate application of nanoscale science to plants and crops for improved outcome and an exploration of their bioavailability and toxicity in the environment. Discusses the morphological, physiological and biochemical responses of plants to nanomaterials and the ability of the nanomaterials in modifying the genetic constitution of plants Emphasizes new applications of nanomaterials, including nanosensors technology and nanomaterials as nanocarriers based antimicrobial phytochemicals. Presents the role of nanotechnology as a novel technique for the remediation of heavy metals by plants. Pollutants are increasing day by day in the environment due to human interference. Thus, it has become necessary to find solutions to clean up these hazardous pollutants to improve human, animal, and plant health. Microbial Biotechnology in Environmental Monitoring and Cleanup is a critical scholarly resource that examines the toxic hazardous substances and their impact on the environment. Featuring coverage on a broad range of topics such as pollution of microorganisms, phytoremediation, and bioremediation, this book is geared towards academics, professionals, graduate students, and practitioners interested in emerging techniques for environmental decontamination.